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The Effect of a Smoke-Free Ordinance on Eating and Drinking Places in Lincoln, Nebraska

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A Bureau of Business Research Report
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Final Report

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Bureau of Business Research
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EXECUTIVE SUMMARY

The Lincoln Smoking Regulation Act which prohibited smoking in most public places and places of employment in Lincoln, Nebraska including restaurants and bars was implemented in January 2005. This report examines the impact of the ordinance on the following measures of business activity in Lincoln:

- Sales revenue of eating and drinking places
- Employment of eating and drinking places
- Gross revenues from keno.

We examine the impact of the ordinance during the year 2005, the first year that the ordinance was in effect. While restaurant and bar activity in Lincoln rose during 2005 by some measures, we focus on performance relative to Omaha in order to isolate the impact of Lincoln's ordinance. The estimated first-year impacts of the ordinance were as follows.

Sales Revenue

- *Total restaurant sales (full-service and limited-service restaurants combined):* Restaurant (eating places) sales account for approximately four-fifths of total sales in the food and drinking places industry. We cannot conclude that the smoking ordinance had any effect on sales revenue in Lincoln's restaurant industry.[1]
- *Drinking places sales:* We identified a statistically significant 6.0% decline in sales in Lincoln's drinking places, which is equivalent to a $169,800 per month sales decline.[2] This translates to a fall of $2,500 per month in sales tax revenue for the City of Lincoln. We did not have sufficient data to estimate what portion of this sales decline was lost to drinking places in other communities, and what portion was spent in other types of Lincoln businesses (see results for Keno below).

[1] There were approximately 340 restaurants in our sales data base in any given month.
[2] There were approximately 65 drinking places in our sales data base in any given month.

Employment

- *Total restaurant employment (full-service and limited service restaurants combined):* We identified a statistically significant 8.0% decline in restaurant employment, which represents a decline of 600 jobs. This decline, however, appeared to be isolated in full-service restaurants, where employment declined 13.5%. We identified no decline in employment in limited-service restaurants.
- *Drinking places employment:* We cannot conclude that the smoking ordinance had any effect on employment in Lincoln's drinking places industry.

Gross Keno Revenues

- *City of Lincoln:* The estimated drop in monthly gross keno revenue (total wagers) in the City of Lincoln was $376,000.
- *Denton and Waverly:* The estimated gain in monthly gross keno revenue was between $70,000 and $80,000 in each community. The decline in Lincoln is much greater than the gain identified in adjacent towns, which suggests that some former keno activity in Lincoln is not simply moving to adjacent jurisdictions, but is being shifted toward other types of spending.

Several caveats must be considered when examining these results. First, we have only estimated the impacts of the ordinance for the year 2005, the first year the ordinance was in effect. It is possible that long-term impacts two to three years after the ordinance is in effect could differ from these impacts in the initial year. Further, over the longer term results for employment and sales should converge.

Second, one must keep in mind that the aggregate results for the industry or its segments do not necessarily reflect the experience of every business. Individual businesses or groups of businesses within each segment may have gained or lost as a result of the ordinance, regardless of the aggregate results presented above. Results of this study, therefore, should not be seen as contrary to the testimonials of individual proprietors or industry employees as such individuals explain how the ordinance has affected them.

Third, it is important to remember that this analysis did not consider all of the economic costs imposed on the consumers as well as on business owners and employees in Lincoln. In particular, some consumers of Lincoln restaurants, bars, and keno gaming have lost an option available to them–smoking in the midst of their chosen activity. Further, businesses may experience reduced profits or increased expenditures in making changes to accommodate patrons. Persons considering the efficacy of the Lincoln smoking ordinance may wish to consider these costs, along with the results of our study, as well as any operating savings for restaurants and bars and the public health benefits in terms of reduced second-hand smoke when evaluating the policy.

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I. PREFACE

Smoking was prohibited in all places of employment and in all public places of Lincoln, Nebraska based on a referendum held on November 17, 2004. The referendum resulted in an almost 2:1 vote in favor of a complete ban. The ordinance was declared effective as of November 22, 2004, while citations for violations were issued from January 1, 2005. The ordinance defines a place of employment as any indoor area under the control of a proprietor that an employee accesses. A public place is defined to be an indoor area to which the public is invited or permitted. Violations of the law include smoking in the establishment and allowing smoking in the establishment. The ordinance applies to all businesses, including private clubs. The only exemptions are businesses in private residences, scientific labs conducting research into the health effects of smoking, and hotels/motels/inns that may permit smoking in up to 20% of their guestrooms or suites.

Given the recent adoption of the ordinance, the Nebraska Department of Health and Human Services contracted with the UNL Bureau of Business Research to assess the impact of the ordinance on activity in the restaurant and bar industry. The following is a final report on the findings of the study.

II. INTRODUCTION

The purpose of the ordinance is to protect employees in the City of Lincoln from the stated health effects of second-hand smoke and to ensure clean air in places of employment. There is an increasing body of literature that documents the adverse effects of second-hand smoke (ANRF 2005), and a number of states and municipalities are implementing smoke-free ordinances in workplaces, restaurants, and bars in order to reduce exposure to second-hand smoke. Like any regulation, however, there are other potential consequences while enhancing workplace health. In particular, those considering the regulation must weigh at least the three factors listed below:

- Workplace Safety/Public Health
- Consumer, Proprietor, and Employee Choice (Economic Efficiency)
- Impact on Industry Activity.

The benefits in terms of workplace safety/public health relate to the earlier issues regarding second-hand smoke. The second set of factors relates to the loss in choice among patrons, workers, and proprietors, as well as potentially reduced profits or increased expenditure for proprietors. As an instance of the last factor, some bar owners have constructed sheltered open-air areas (such as a canopy) to accommodate patrons who wish to smoke. While an examination of these factors is outside the scope of our study, in acknowledgment of their importance, we provide a brief discussion toward the end of the report.

The focus of our study is the third factor: the economic consequence of the smoking ordinance on eating and drinking places, specifically, restaurants, bars, and revenues from keno. Although we are not able to track impacts on business profits, we do examine whether measures of aggregate economic activity such as sales and employment have increased or declined with the ordinance. We study the food services and drinking places industry in aggregate and also separately for key industry sub-segments such as drinking places, full-service restaurants, limited service restaurants, and keno activity. We also examine whether keno activity is migrating to nearby areas (that do not have a ordinance) or to other activities within Lincoln. Results from the study will be of value to policymakers in Lincoln, to other cities of Nebraska considering similar ordinances, and to communities around the country.[3]

III. METHODOLOGY

The general methodological approach is to isolate the impact of the smoking ordinance on Lincoln's eating and drinking places and on Lincoln's keno industry. This is done by measuring the change in industry activity before and after the ordinance. We utilize two measures of industry activity: sales and employment. We also examine the effect of the ordinance on key industry segments such as drinking places only and eating establishments only. Restaurants can further be divided into full-service restaurants and limited-service restaurants. We also examine keno separately. It is important to examine industry segments separately because the effect of the ordinance, if any, may fall primarily on selected segments of the industry. A final methodological issue is the impact of the ordinance outside of Lincoln, on

[3] A few recent examples of such bans are in the states of Montana and Rhode Island and the cities of Columbus, Ohio; Minneapolis, Minnesota; Madison, Wisconsin; and Austin, Texas. The ban in Louisville, Kentucky will go into effect on November 15, 2006.

surrounding communities. In particular, if the level of industry activity changes in Lincoln after the ordinance, there also may be changes in neighboring towns.

A. Measuring the Impact of the Ordinance

This section describes the regression model that we use to estimate the effect of Lincoln's smoking ordinance on monthly revenue (or employment) in eating places, drinking places, and keno. We consider both the direct impact of the ordinance on Lincoln's industry activity and, in the case of keno, the spillover effects of the ordinance on neighboring communities within the Lincoln Metropolitan Statistical Area (MSA). Letting *y* denote monthly real industry activity per person in Lincoln, our basic regression includes monthly seasonal effects, yearly time effects, and total MSA employment as a control for cyclical demand. Our binary treatment variable, *ban*, equals zero before the ordinance is enacted and assumes the value of unity for each month the smoking ordinance is in effect.

1 Direct Effect on Lincoln's Economic Activity

An initial indicator of the smoking ordinance's effect on industry activity in Lincoln is the difference in the average post-ban value of *y* (measured as revenue or employment) and the average pre-ban value in the city of Lincoln, $\bar{y}_{post-ban} - \bar{y}_{pre-ban}$. To isolate the effect of the smoking ordinance, however, one must consider the effects of concurrent demand and supply shifts that are independent of the smoking ordinance.

a. Simple (Unconditional) Difference-in-Difference Estimator

One way to isolate the effect of the smoking ordinance is by comparing the difference in Lincoln's average post- and pre-ban revenue to that of a control city. We choose Omaha as our control city because it is similar to Lincoln in terms of its demographic and economic structure but was not yet subject to a smoking ordinance in 2005. This method of accounting for factors extraneous to the ordinance results in a *Simple Difference-in-Difference Estimator*. We calculate the change in each of the average figures in Lincoln after the ordinance and the change in average figures in Omaha over the same period. We then compute the difference between these two figures. The objective is to isolate the effect of the ordinance under the assumption that both locations experience the same outside

influences (apart from the ordinance) that might affect industry performance of the two locations in the period considered.

b. Conditional Difference-in-Difference Estimator

To further isolate the effect of the smoking ordinance on industry activity in Lincoln, we calculate the average change in post- and pre-ban revenue or employment in Lincoln relative to that in Omaha, *conditional on seasonal shifts and annual trends common to both cities and cyclical patterns captured by movements in MSA total employment*. Our conditional difference difference-in-difference estimator corresponds to the parameter δ in the following panel data regression model that explains industry activity, *y*, in both Lincoln and the control city of Omaha:

$$y_{i,t} = \alpha + \alpha_i linc_i + \sum_{k=1}^{11} \beta_{1k} monthk_t + \sum_{h=2}^{T} \beta_{2h} yearh_t + \beta_3 totalemp_{it} + \delta(linc_i * ban_t) + \varepsilon_{it}, \quad (1)$$

where the binary variable *linc* equals one if the observation corresponds to Lincoln and *linc* is zero otherwise. The conditional difference-in-difference estimator [δ in regression (1)] measures the divergence between the difference in post-ban revenue and pre-ban revenue in Lincoln, Nebraska, the treatment city, and the difference in post-ban revenue and pre-ban revenue in Omaha, Nebraska, the control city, after removing the effects of other shift variables that are independent of the smoking ordinance. (See Appendix 2 for a complete description of the variables and estimation method.)

2 Effect on Neighboring Communities.

In the cases where we find a significant negative impact of the ordinance on industry revenue within Lincoln, we examine whether an off-setting impact is evident in towns around Lincoln. We estimate the impact of the ordinance on revenue in Lincoln (where the ordinance is in place) as well as on revenue generated in the total Lincoln Metropolitan Statistical Area (not all of which is under the purview of the current ordinance). The analysis identifies whether revenue lost to Lincoln is lost to the metropolitan area overall or whether the metropolitan revenue is unchanged, suggesting that economic activity has shifted to nearby towns. If the revenue appears to have shifted to nearby communities, this suggests a net loss of economic

activity and revenue in Lincoln. If revenue does not increase in nearby towns, this suggests that restaurant or keno spending may have shifted to other types of spending, perhaps other types of recreation and entertainment.[4] Much of this activity likely would occur within Lincoln, generating both employment and tax revenues to partially compensate for lost restaurant, bar, or keno revenues.

To capture empirically the extent of any spill-over effects from the smoking ordinance, we add a revenue equation for a number of Lincoln MSA towns to our Lincoln (city only) and Omaha regression model. We then estimate any post-ban change in each of the surrounding town's average revenue relative to the change in the control city. The resulting conditional difference-in-difference estimator provides a measure of any spill-over effects of Lincoln's smoking ordinance.

We also estimate regression (1) using aggregate revenue generated anywhere within the Lincoln MSA to obtain a measure of the total revenue effect of the Lincoln smoking ordinance. Similarly, by estimating regression (1) as a panel including revenue from each town in the MSA along with the City of Lincoln, we can identify any spill-over effects from the ordinance. Because some of the towns in the Lincoln MSA are located between the cities of Lincoln and Omaha, Omaha again is a natural choice as a control city, unaffected by the imposition of the smoking ordinance through 2005.

B. Measures of Industry Activity

We examine two measures of aggregate industry activity: sales and employment. Sales are the more comprehensive measure as sales figures reflect changes in market conditions immediately. Employment reacts more slowly to changes in demand and thus might not fully reflect the smoking ordinance's effect for six months to a year. Given an interest in the fortune of industry workers as well as industry sales, we provide estimates using both measures. We analyze the employment data pertaining to the food services and drinking places industry. The segments identified for separate analysis are drinking places and restaurants (and where possible full service restaurants, and limited service restaurants separately). The definitions of the

[4] A third possibility is that Lincoln Keno players could shift toward playing internet Keno.

industry segments that constitute the food and drinking places industry are presented in Appendix 1.

1. Sales Revenue

The sales revenue data are the figures reported by individual establishments to the Nebraska Department of Revenue that are used to calculate the establishment's state and local taxes. The reporting interval for each establishment, however, depends on the level of its estimated annual revenue. Large establishments with estimated annual sales in excess of $60,000 report monthly revenue figures; medium-sized establishments with estimated annual sales of at least $18,000 but less than $60,000 report quarterly revenue figures; and small establishments with estimated annual sales of less than $18,000 report their annual sales every December.

The reporting convention inherent in the monthly revenue data limits our ability to compare eating and drinking establishments' post-ban revenue to the pre-ban revenue of the same population of establishments both in the City of Lincoln and in the Omaha control city. To avoid this problem, we requested and received from the Department of Revenue monthly sales figures that correspond to only the large eating establishments and drinking establishments. Thus, our monthly revenue figures refer to the same population each month. Although this population consists of only a subset of eating and drinking establishments in Lincoln and Omaha, the large establishments generate around 98% of the industry's total revenue.

To net-out the effect of price changes, we convert the revenue data to current dollar figures using the CPI for all urban consumers. To ensure the scale of Lincoln's and Omaha's eating and drinking establishments' revenue is comparable, we scale each city's figures by the relevant MSA population.

2. Employment

The employment data come from the *Current Employment Statistics* and the *Quarterly Census of Employment and Wages*, both published by the Bureau of Labor Statistics. As mentioned above, the data on employment are broken down by the three main categories in the food and drinking places industry – full service restaurants, limited service restaurants, and drinking places. We examine each category separately by the above procedure to obtain the

effect of the ordinance in the individual segment. We also repeat the analysis for the entire eating and drinking places industry which constitutes seven NAICS sub-segments. The definitions of each of these have been provided in Appendix 1. The control group for the analysis of employment is Douglas County,[5] the county where Omaha is located. Douglas County is the most populous county in the Omaha metropolitan area and comparable to Lincoln. We account for differences in size between the City of Lincoln and Douglas County by considering employment in each of the segments as well as of the entire industry as a percentage of the total populations.

3. Keno

Our keno data span the period from January 2000 through December 2005. Because a portion of keno revenue is paid to the local government, monthly wagers are carefully tracked at the local level. We collected gross keno revenue from the treasurer's office of the Nebraska cities of Omaha and Lincoln and from the Lincoln MSA towns of Denton, Raymond, Sprague, and Waverly. We also gathered a separate series on keno revenue from bets made in State Fair Park which is located within the city limits of Lincoln but is not subject to the Lincoln smoking ordinance. Our keno revenue figures represent the total amount that was bet each month and are indicative of the volume of keno activity in each location. We allow for price changes by converting to 2005 dollars using the Consumer Price Index for all urban consumers. We also scale the monthly figures by the relevant MSA population.

IV. RESULTS

A. Sales Revenue

1. Sales Revenue per Person in Lincoln MSA from January 2000 – June 2005

As noted in the previous section, the reporting convention inherent in the sales revenue data allows us to identify only monthly sales revenue of large eating and drinking places for the years from 2000 through 2004 and compare it to revenue received by large establishments in the twelve months after the smoking ban.

[5] The estimated populations for 2004 in Douglas County and Lincoln City were 482,112 and 236,146 respectively.

Figure 1(a) pertains to the sales revenue for large-sized eating establishments. The overall trend is of growth. The average growth of revenue of the twelve months of 2005 has been higher than the average for the first five years in the decade.

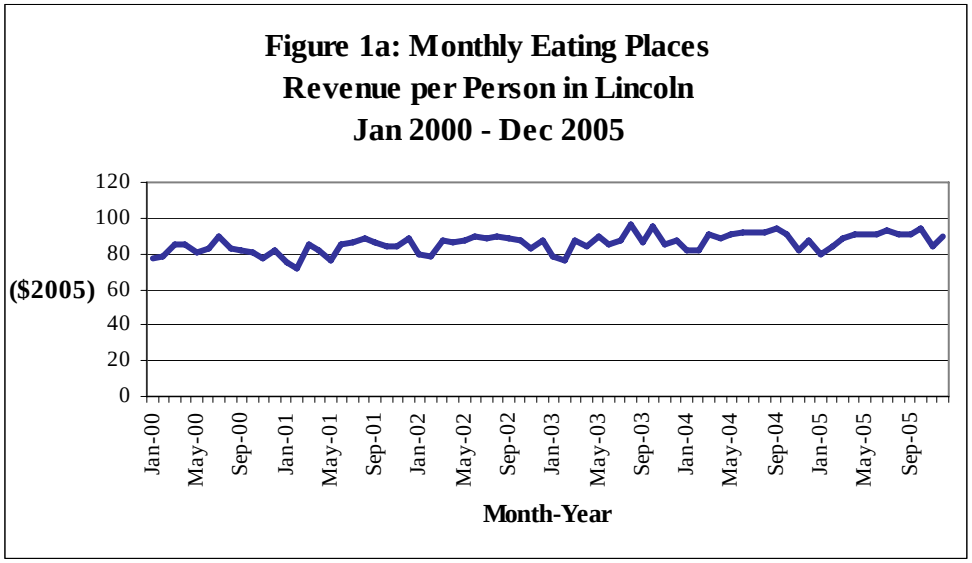


Figure 1(b) pertains to the revenue of large-sized drinking establishments. The overall trend is a declining one. The revenue generated in 2005 shows an acceleration of this trend. The average revenue in 2005 is lower than the average over the years 2000 through 2004.

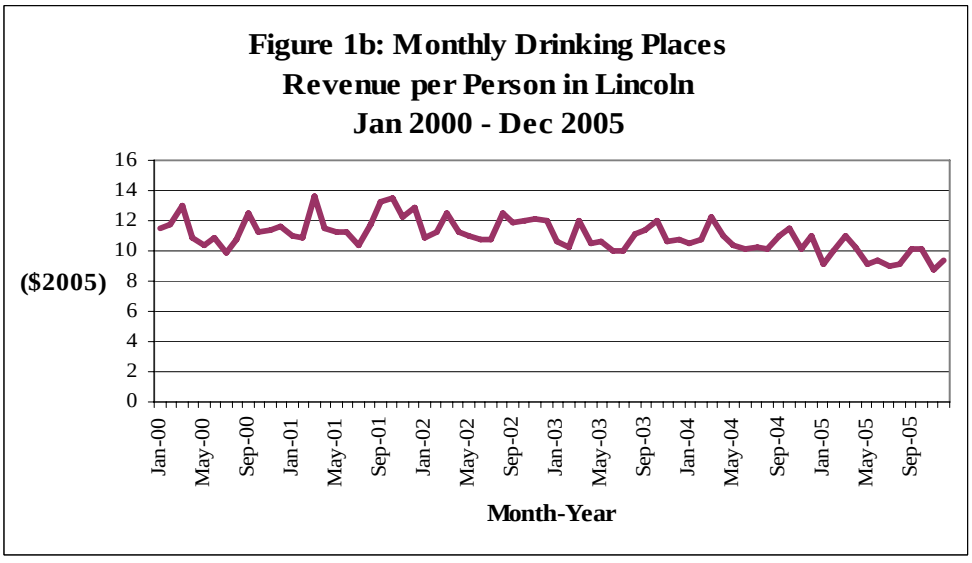
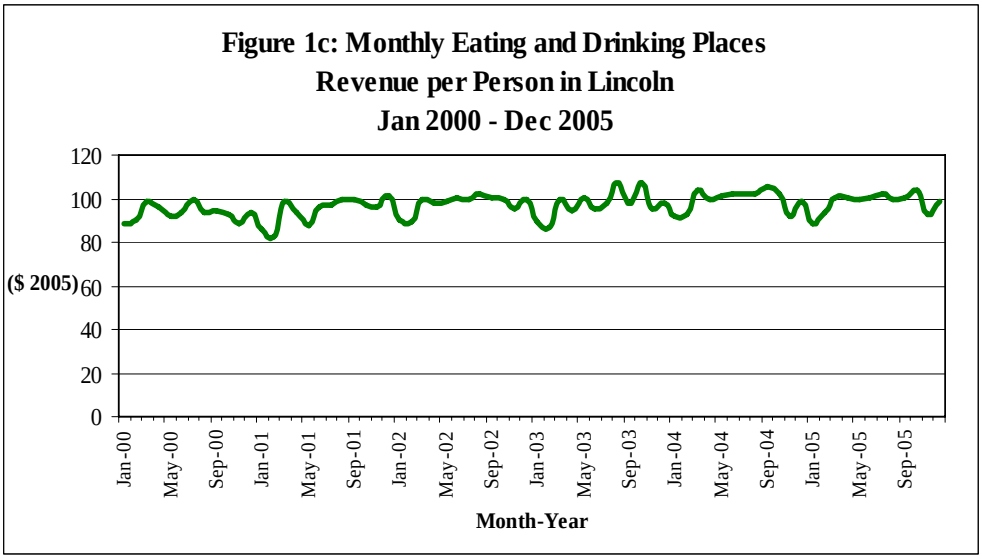


Figure 1(c) graphs the per capita sales revenue of large eating and drinking establishments in Lincoln over the sample period January 2000 through December 2005.



2. The Simple Difference-in-Difference Results

Table 1 presents the simple difference-in-difference estimates of revenue losses in eating and drinking places associated with Lincoln's smoking ordinance. All revenue figures are reported in 2005 dollars and correspond to monthly sales revenue received by establishments whose annual sales revenue exceeds $60,000. The table gives average revenue per person (residing in the relevant MSA) of eating places, drinking places, and of both eating and drinking places for the City of Lincoln (treatment group) and Omaha (control group) in the years before and after the Lincoln smoking ordinance of 2005. In each panel, column (1) corresponds to the average revenue per person in the particular category prior to the Lincoln smoking ordinance, column (2) to the average after the Lincoln smoking ordinance, and column (3) to the change in the average revenue per person after the ban was implemented. The simple difference-in-difference estimate of the revenue rate response is in column (4). This coefficient captures the change in average monthly revenue per person in the corresponding food or drink category in Lincoln, where the smoking ordinance occurred, relative to the change in the average monthly revenue per person in the corresponding food and drink category in Omaha, where there was no ordinance in 2005.

The results for eating places' revenue per person, for Lincoln and Omaha, are in Panel A of Table 1. In Lincoln, average monthly revenue from eating places rose $3.58 per person from

its pre-ban average of $85.28 per person, which translates into approximately $982,595 added monthly revenue or about a 4 percent increase in monthly sales revenue in Lincoln's eating places industry.

In Omaha, average monthly eating places' revenue per person also increased after the ordinance was implemented. Revenue per person in Omaha jumped $4.24, an increase of $2,839,228 or a 6 percent increase in eating places' sales in Omaha, which suggests demand for eating places increased in both Lincoln and Omaha in 2005. Thus, even though average revenue per person in Lincoln increased in 2005, this increase was smaller than the increase that occurred in the control city of Omaha. The resulting simple difference-in-difference estimate is a decline of $0.66 per person in Lincoln's eating places revenue associated with the smoking ordinance. This average decline is estimated very imprecisely, however, with its estimated standard error more than three times its $0.66 value. Therefore, we cannot conclude with any degree of confidence that average eating places' revenue in Lincoln was affected by the implementation of the smoking ordinance.

Panel B presents the comparison of the average monthly revenue per person in drinking places before and after the smoking ordinance in Lincoln and Omaha. The drinking places sales revenue in Lincoln before the smoking ordinance was $11.28 per person compared to $7.64 per person in Omaha. After the smoking ordinance was implemented, drinking places revenue per person in Lincoln fell about $1.66 per person (15 percent decrease in monthly revenue), while in Omaha monthly revenue declined about $0.93 per person (12.4 percent decrease in monthly revenue). Together, these estimates suggest that the approximate decline in Lincoln's drinking places monthly revenue associated with implementation of the smoking ordinance was $0.73 per person, or a $201,233 monthly decline. The small standard error of this estimate allows us to conclude that, based on the simple difference-in-difference method, the implementation of the smoking ordinance was associated with a 6.7% fall in drinking places' monthly sales revenue in Lincoln.

Table 1
Sales Revenue ($2005) - Simple Difference-in-Difference

	Revenue per Person				Total Revenue	
	Pre-Smoking Ban (Jan 2000 – Dec 2004) (1)	**Post-Smoking Ban (Jan 2005 - Dec 2005)** (2)	**Difference (2) - (1)** (3)	**Simple Dif-in-Dif Estimator** (4)	**Difference** (5)	**Simple Dif-in-Dif** (6)
A *Average eating places real revenue*				**-0.657**		**-$180,123**
				(2.139)		
Treatment Group:						
City of Lincoln	**85.282**	**88.866**	**3.584**		$982,595	
	(1.081)	(1.308)	(1.697)			
Control Group:						
City of Omaha	**71.221**	**75.462**	**4.241**		$2,839,228	
	(0.789)	(1.036)	(1.302)			
B *Average drinking places real revenue*				**-0.734****		**-$201,233****
				(0.373)		
Treatment Group:						
City of Lincoln	**11.279**	**9.62**	**-1.659**		($454,823)	
	(0.152)	(0.213)	(0.262)			
Control Group:						
City of Omaha	**7.638**	**6.713**	**-0.925**		($619,305)	
	(0.253)	(0.0845)	-0.266			
C *Average eating and drinking places real revenue*				**-1.391**		**-$381,357**
				(2.114)		
Treatment group:						
City of Lincoln	**96.562**	**98.417**	**1.925**		$527,772	
	(1.014)	(1.318)	(1.663)			
Control group:						
City of Omaha	**78.859**	**82.175**	**3.316**		$2,219,923	
	(0.689)	(0.0845)	(1.306)			

Pre-Smoking Ordinance years are 2000-2004. PostSmoking Ordinance year is 2005. Standard errors are in parentheses.
Variances were calculated allowing for sub-sample heteroskedasticity and autocorrelation.
*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

Panel C provides the mean monthly revenue figures for eating and drinking establishments combined. In Lincoln, average monthly revenue from both eating and drinking places went up by $1.93 per person from its pre-ordinance average of $96.56 per person. This translates into approximately $527,772 added monthly revenue or about a 2 percent increase in monthly sales revenue in Lincoln's eating and drinking places.

In Omaha, average monthly eating and drinking places' revenue per person also increased after the Lincoln ordinance was implemented. Revenue per person in Omaha went up by $3.32, an increase of $2,219,923 or about a 4 percent increase in eating and drinking places' total sales in Omaha. This suggests demand for eating and drinking places went up in both Lincoln and Omaha in 2005; however, although average revenue per person in Lincoln increased in 2005, this increase was smaller than the increase that occurred in the control city of Omaha. The resulting simple difference-in-difference estimate is a decline of $1.39 per person in Lincoln's eating and drinking places revenue that is associated with the smoking ordinance. This average decline is estimated very imprecisely, however, with its estimated standard error equal to $2.11. Therefore, we cannot conclude with any degree of confidence that average revenue of eating places combined with drinking places in Lincoln was affected by the implementation of the smoking ban.

The simple difference-in-difference results suggest that implementing the Lincoln smoking ordinance had mixed effects on sales revenue within the eating and drinking places industry. After controlling for common factors affecting revenue in both Omaha and Lincoln, we found that the decline in drinking establishments' revenue in Lincoln was statistically significantly larger than the decline in Omaha whereas we found no statistically significant difference in the relative change in eating places' revenue. When we combined sales revenue of eating and drinking establishments, we could not estimate the difference in the average revenue changes in Lincoln and Omaha precisely enough to conclude the Lincoln industry as a whole was affected by the smoking ordinance.

3. Conditional Difference-in-Difference Results

The conditional difference-in-difference estimator provides a more precise estimate of the smoking ordinance's effect on Lincoln's eating and drinking places monthly sales revenue by explicitly controlling for seasonal and time effects common to Lincoln and Omaha as well as accounting for local demand differences in the two cities. Panel A of Table 2 presents the difference-in-difference estimates of the effect of the smoking ordinance on Lincoln's monthly revenue (in $100) per person for eating places, Panel B presents the estimates for drinking

places, and Panel C presents the estimates for the industry as a whole. The full set of regression results is presented in Appendix 3.

According to the point estimates in Panel A, average monthly sales revenue in Lincoln's eating places fell about $0.22 per person. This amounts to an estimated decline in average monthly sales of approximately $59,800, which is about a third the size of the simple difference-in-difference estimate. Although the standard error of the conditional difference-in-difference estimate is half the size of the simple difference-in-difference standard error, it is again much larger than the estimated smoking ordinance effect. Therefore, we cannot conclude that the smoking ordinance had any effect on average sales revenue in Lincoln's eating places industry.

Panel B shows an estimated decline in average drinking places revenue after the smoking ordinance of about $0.62 per person, slightly smaller than the simple difference-in-difference estimate. The precision of the estimated smoking ordinance effect on monthly drinking places revenue also increased. The standard error of the estimate declined from $0.37 for the simple difference-in-difference estimate to $0.36 for the more precise estimator. These results suggest that the implementation of the Lincoln smoking ordinance was associated with a decline in drinking places revenue per person of approximately $169,800 per month. This corresponds to a 6% fall in average monthly sales.

According to the point estimates in Panel C, average monthly sales revenue in Lincoln's eating and drinking places combined fell by about $0.62 per person. This amounts to an estimated decline in average monthly sales of approximately $183,687, which is about half the size of the simple difference-in-difference estimate. Although the standard error of the conditional difference-in-difference estimate is two-thirds the size of the simple difference-in-difference standard error, it is about twice the size of the estimated smoking-ordinance-effect. Therefore, we cannot conclude that the smoking ordinance was associated with any change in the combined average sales revenue of Lincoln's eating and drinking places.

Based on one year of post-ban monthly observations on eating and drinking places sales revenue in Lincoln and in Omaha, we find mixed results for the revenue effects of the smoking ordinance in these industries. Although both eating and drinking places in Lincoln experienced a larger decline in average monthly revenue than in Omaha, only in the case of drinking places can we attribute this decline to the smoking ordinance.

Table 2
Sales Revenue ($2005) - Difference-in-Difference
Treatment Group: City of Lincoln
Control Group: City of Omaha

		Dif-in-Dif Estimator	
		Revenue ($100) per Person (1)	**Total Revenue** (2)
A. *Average eating places real revenue*			
	BLINC	**-0.0022** (0.0113)	**-$59,769**
B. *Average drinking places real revenue*			
	BLINC	**-0.0062*** (0.0036)	**-$169,800***
C. *Average eating and drinking places real revenue*			
	BLINC	**-0.0067** (0.0136)	**-$182,377**

Pre-Smoking Ordinance years are 2000-2004. Post-Smoking Ordinance year is 2005. Standard errors are in parentheses.
Variances were calculated allowing for heteroskedasticity and autocorrelation.
*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

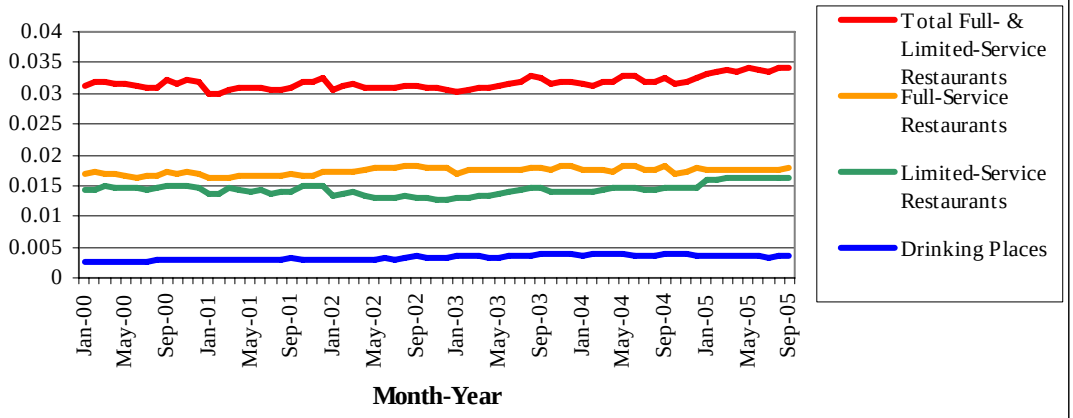
B. Employment

1. Employment per Person Growth in Lincoln from January 2000 –September 2005

Total employment per person in the food services and drinking places industry has grown since January 2000 as Figure 2a shows. Growth also continued from the last three quarters of 2004 to the first three quarters of 2005, when the smoking ordinance was in effect. The average number of persons employed in the total food services and drinking places industry in the second, third and fourth quarter of 2004 was about 10,170. It was 10,615, on average, in the first, second, and third quarters of 2005. This is an approximate 4.4 percent increase in jobs during this time period.

Figure 2b shows the growth in employment per person in the three largest sectors of the food services and drinking places industry: full-service restaurants, limited-service restaurants, and drinking places. It also includes total full- and limited-service restaurant employment per person. Overall, each sector has experienced growth since January 2000. The average number of persons employed in the full-service restaurant sector in the last three quarters of 2004 was about 4,620, increasing to an average of about 4,650 in the first three quarters of 2005. The limited-service restaurant sector experienced about a 12 percent increase in the number of persons employed, with the second, third, and fourth quarters of 2004 averaging about 3,820 persons, and the first, second, and third quarters of 2005 averaging about 4,275 persons. Together the full- and limited-service restaurant employment per person increased about 6 percent from the last three quarters in 2004 to the first three quarters in 2005. The drinking places sector experienced about a 4 percent loss in employment from the last three quarters of 2004 to the first three quarters of 2005. The average employment was about 975 in the second, third, and fourth quarters of 2004 and approximately 935 in the first, second, and third quarters of 2005.

Figure 2b: Monthly Employment per Person Growth in the sectors of the Food Services & Drinking Places Industry in Lincoln Jan 2000 - Sept 2005



2. Simple Difference-in-Difference Results

Table 3 presents the simple difference-in-difference estimates of average monthly job losses in the food services and drinking places industry associated with Lincoln's smoking ordinance. The table shows average monthly employment by restaurant category for the City of Lincoln (treatment group) and Douglas County (control group) in the years before and after the Lincoln smoking ordinance was implemented on January of 2005. In each panel, column (1) corresponds to the average employment per person prior to the Lincoln smoking ordinance, column (2) corresponds to the average after the Lincoln smoking ordinance, and column (3) corresponds to the change in the average employment per person after the ordinance was imposed. The simple difference-in-difference estimate of the employment rate response is in column (4). This coefficient captures the change in monthly employment per person in the corresponding food and drink category in Lincoln, where the ordinance occurred, relative to the change in the employment per person in the corresponding food and drink category in Douglas County, where there was no ordinance through 2005.

Table 3
Monthly Employment (# of jobs) - Simple Difference-in-Difference

	Employment per Person				Total Employment	
	Pre-Smoking Ban (Jan 2000 – Dec 2004) (1)	**Post-Smoking Ban (Jan 2005 – Sept 2005)** (2)	**Difference (2) - (1)** (3)	**Simple Dif-in-Dif Estimator** (4)	**Difference** (5)	**Simple Dif-in-Dif** (6)
A. *Average total food & drink employment per person*				**-0.0025***** (0.0008)		**-636.0*****
Treatment Group:						
City of Lincoln	**0.0366** (0.0004)	**0.0402** (0.0001)	**0.0035** (0004)		906.6	
Control Group:						
Douglas County	**0.0425** (0.0003)	**0.0485** (0.0006)	**0.0060** (0.0007)		2840.2	
B. *Average total full- and limited-service restaurant employment per person*				**-0.0038*** (0.0007)		**-969.3*****
Treatment Group:						
City of Lincoln	**0.0314** (0.0002)	**0.0338** (0.0001)	**0.0024** (0.0002)		615.3	
Control Group:						
Douglas County	**0.0343** (0.0004)	**0.0405** (0.0005)	**0.0062** (0.0006)		2917.6	
C. *Average full-service restaurant employment per person*				**-0.0038*** (0.0004)		**-967.6*****
Treatment Group:						
City of Lincoln	**0.0173** (0.0001)	**0.0176** (0.0001)	**0.0003** (0.0002)		73.8	
Control Group:						
Douglas County	**0.0193** (0.0003)	**0.0234** (0.0003)	**0.0040** (0.0004)		1917.4	
D. *Average limited-service restaurant employment per person*				**0.0000** (0.0003)		**-1.8**
Treatment Group:						
City of Lincoln	**0.0141** (0.0002)	**0.0162** (0.0001)	**0.0021** (0.0002)		541.5	
Control Group:						
Douglas County	**0.0150** (0.0001)	**0.0171** (0.0002)	**0.0021** (0.0002)		1000.2	
E. *Average drinking places employment per person*				**0.0010*** (0.0002)		**247.2*****
Treatment Group:						
City of Lincoln	**0.0032** (0.0001)	**0.0035** (0.0000)	**0.0003** (0.0001)		80.4	
Control Group:						
Douglas County	**0.0037** (0.0001)	**0.0030** (0.0000)	**-0.0006** (0.0001)		-307.0	

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.
Variances were calculated allowing for sub-sample heteroskedasticity and autocorrelation.
*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

The results for the first employment category, total food services and drinking places employment per person, for Lincoln and Douglas County, are in Panel A of Table 3. In Lincoln, from before to after the ordinance was imposed, the total food services and drinking places employment per person increased by 0.0035 workers per person, which translates into approximately 907 more jobs or about a 9 percent increase in employment in the total food services and drinking places industry.

In Douglas County, the total food services and drinking places employment per person also increased after the ordinance was implemented. Workers per person in Douglas County increased 0.006 workers per person, a gain of 2,840 jobs or a 14% increase in jobs in Douglas County's food services and drinking places industry. This suggests that demand and supply factors common to both Lincoln and Douglas County led to increased employment at the same time that Lincoln implemented the smoking ordinance. Thus, even though average employment per person in Lincoln increased in 2005, this increase was smaller than the increase that occurred in the control location of Douglas County. Our simple difference-in-difference estimate of the total food services and drinking places employment per person response to the implementation of the Lincoln smoking ordinance is -0.0025, with a standard error of .0008. This translates into an approximate loss of 636 jobs or a 7% decline in employment in Lincoln's total food services and drinking places industry that is associated with the imposition of the smoking ordinance.

Decomposing the total food services and drinking places industry employment into four categories – total full-service and limited-service restaurants, full-service restaurants, limited-service restaurants, and drinking places – allows us to examine in which segment the impact of the smoking ordinance was most prominent. Panel B presents the comparison of the before and after effects in Lincoln and Douglas County for total full-service and limited-service restaurant employment per person. The full- and limited-service employment rate in Lincoln before the smoking ordinance was 0.0314 compared to a rate of 0.0032 for drinking places. After the smoking ordinance was implemented, monthly full- and limited-service restaurant employment per person in Lincoln increased about 615 jobs (8.0 percent increase), while in Douglas County monthly employment increased about 2,918 (18.0 percent increase). Taken together, these figures suggest that the approximate monthly change in total full- and limited-service employment per person associated with implementation of the Lincoln smoking ordinance was -

.0038, translating into approximately 969 fewer jobs in the total full- and limited-service restaurants relative to Douglas County.

For full-service restaurant employment per person, shown in Panel C of Table 3, the estimated response of the Lincoln smoking ordinance is -0.0038, or about an 968 job loss (22 percent decrease in industry employment). The simple difference-in-difference estimate of the smoking ordinance effect on full-service restaurant employment in Lincoln is the same as on total full- and limited-service restaurants. Therefore, it is not surprising, when examining Panel D of Table 3, that the estimated response to the ordinance on Lincoln's employment per person in limited-service restaurants is .0000 with a standard error of .0003. It appears that employment in limited-service restaurants was unaffected by the smoking ordinance, most likely because most, if not all, limited service restaurants prohibited smoking before the city-wide ordinance was implemented.

Panel E presents the comparison of the average employment per person in drinking places before and after the smoking ordinance in Lincoln and Douglas County. The drinking places employment rate in Lincoln before the smoking ordinance was 0.0032 compared to a rate of 0.0037 in Douglas County. After the smoking ordinance was implemented, drinking places employment per person in Lincoln increased about 80 jobs (10 percent increase), while in Douglas County employment declined about 307 jobs (18 percent decrease). These figures suggest that the approximate change in drinking places employment per person associated with implementation of the Lincoln smoking ordinance was 0.001, translating into approximately 247 more jobs in Lincoln's drinking places relative to Douglas County.

These results suggest that implementation of the Lincoln smoking ordinance had mixed effects on the different sectors within the food services and drinking places industry. The simple difference-in-difference results suggest that although the entire sector lost about 636 jobs after the smoking ordinance was imposed, the drinking places sector gained jobs; the full-service restaurants lost jobs; and limited-service restaurants neither gained nor lost jobs. Employment in full-service restaurants fell 22%, and employment in drinking places increased 29%.

3. Conditional Difference-in-Difference Results

Table 4 presents the conditional difference-in-difference estimates of the food services and drinking places' employment response to the smoking ordinance. The conditional difference-in-difference estimator provides a more precise estimate of the smoking ordinance's effect on Lincoln's employment than the simple difference-in-difference estimator by explicitly controlling for seasonal and time effects common to Lincoln and Omaha as well as accounting for local demand differences in the two cities.

The first panel of Table 4 reports the estimated effect of the smoking ordinance on the total food services and drinking places industry in Lincoln. This estimate suggests that average monthly employment fell 0.0014 jobs per person, which is a decline of 352 jobs per month in the total food services and drinking places sector. We conclude that the smoking ordinance is associated with about a 3.7% decline in the total sector's monthly employment.

If we examine restaurant employment only, Panel B shows an estimated loss of about 579 jobs per month or a 7% fall in combined full-service and limited service restaurants' employment in Lincoln. When we further disaggregate by restaurant type, we find that only employment in full-service restaurants was affected by implementation of the smoking ordinance. The estimated full-service restaurants' response in Panel C is estimated at 0.0023 fewer jobs per person or a loss of about 603 jobs per month. This corresponds to about a 13.5% fall in monthly full-service restaurant employment in Lincoln. Although the estimated employment response of limited-service restaurants, presented in Panel D, is now positive, its standard error is too large to conclude there was any change in average monthly employment in this sector after the ordinance was imposed.

Examination of the employment effect in the drinking places sector shows a much smaller estimate than was found using the simple difference-in-difference estimator of the previous section. The estimated job increase, presented in Panel E, is now only 0.0003 jobs per person compared to the previous estimate of 0.001 jobs per person. Because the estimated standard error did not fall by the same proportion, we can no longer conclude that the Lincoln smoking ordinance was associated with any change in employment in Lincoln's drinking establishments.

Table 4

Monthly Employment (# of jobs) – Difference-in-Difference

Treatment Group: City of Lincoln

Control Group: Douglas County

		Dif-in-Dif Estimator	
		Employment per Person (1)	**Total Employment** (2)
A. *Average total food & drink employment per person*			
	BLINC	-0.0014**	-351.7**
		(0.0006)	
B. *Average total full- and limited-service restaurant employment per person*			
	BLINC	-0.0023***	-579.4***
		(0.0006)	
C. *Average full-service restaurant employment per person*			
	BLINC	-0.0023***	-603.5***
		(0.0004)	
D. *Average limited-service restaurant employment per person*			
	BLINC	0.0004	105.5
		(0.0004)	
E. *Average drinking places employment per person*			
	BLINC	0.0003	84.5
		(0.0002)	

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

The results from the conditional difference-in-difference estimation again show that the effect of Lincoln's smoking ordinance on employment in the food services and drinking places industry differs by the type of establishment. After accounting for common seasonal and time effects in Lincoln and Omaha and local demand and supply factors unrelated to the smoking ordinance, we found that only the full-service restaurants lost jobs after the implementation of the smoking ordinance in January 2005. We estimate that, on average, employment in full-service restaurants fell by 604 jobs per month, an employment decline of about 13.5%. We found

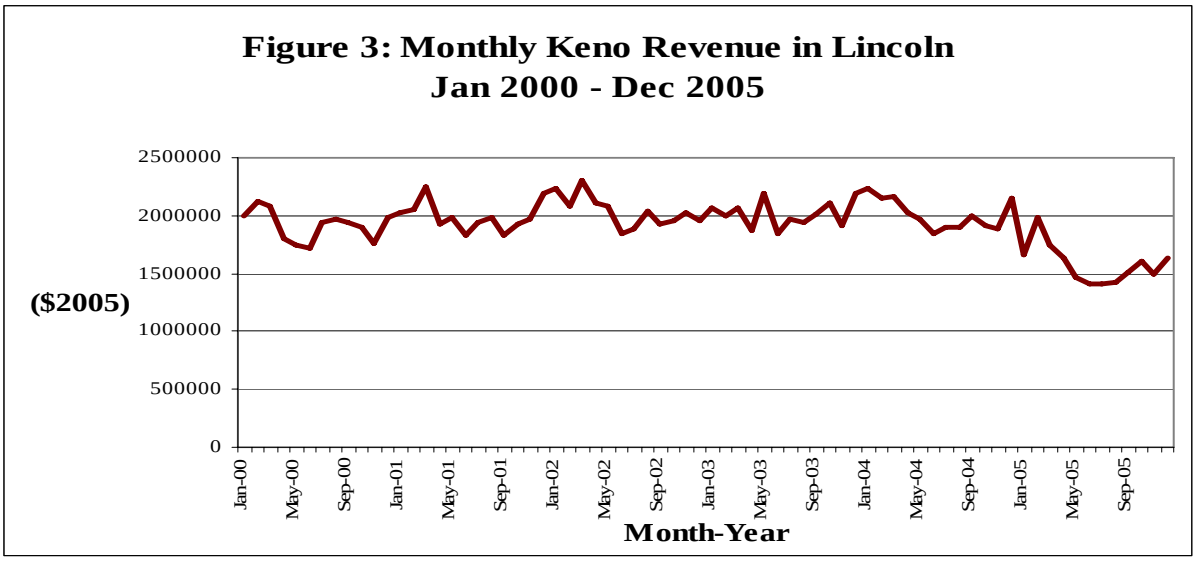
no employment effect from implementation of the smoking ordinance on either the limited-service restaurants or drinking places for the first year after the ordinance was implemented.

C. Keno Revenue

1. City of Lincoln – Omaha Results

a. Keno Revenue in the City of Lincoln from January 2000 to December 2005

Figure 3 below pertains to monthly gross keno revenues for the City of Lincoln (in $000s of December 2005) from January 2000 to December 2005. As the graph indicates, keno revenue is volatile, with a negative trend for the year 2005. The average monthly revenue for 2005 was $1,630,428, which is lower than the mean for the first five years of the decade.



b. The Simple Difference-in-Difference Results

Table 5 presents the simple difference-in-difference estimate of the effect of the smoking ordinance on keno revenue in the city of Lincoln with Omaha as the control city. The first three columns give average monthly keno revenue per MSA person before the ordinance, after the ordinance, and the resulting change in revenue after the ordinance. We see that monthly keno revenue fell about $1.69 per person in Lincoln and $0.26 per person in Omaha. The simple difference-in-difference method attributes the excess decline in Lincoln's revenue to the smoking ordinance. Using this method, we conclude that the smoking ordinance was associated with an average monthly fall in Lincoln's keno revenue of $1.43 per person or an average loss of $391,575 in monthly revenue (wagers).

Table 5

Keno Revenue ($2005) – Simple Difference-in-Difference

	Revenue per Person				Total Revenue	
	Pre-Smoking Ban (Jan 2000 - Dec 2004)	**Post-Smoking Ban (Jan 2005 – Dec 2005)**	**Difference (2) - (1)**	**Simple Dif-in-Dif Estimator**	**Difference**	**Simple Dif-in-Dif**
	(1)	(2)	(3)	(4)	(5)	(6)
A. *Gross Keno Revenue*				**-1.428***** (0.2844)		**-$391,575*****
Treatment Group:						
City of Lincoln	**7.311** (0.0786)	**5.621** (0.2115)	**-1.690** (0.2256)		-$463,261	
Control Group:						
City of Omaha	**6.627** (0.0872)	**6.366** (0.1495)	**-0.261** (0.1731)		-$175,037	

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for sub-sample heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

c. The Conditional Difference-in-Difference Results

Table 6 presents the conditional difference-in-difference estimate of the average fall in monthly keno revenue in Lincoln that can be attributed to the smoking ordinance. After taking into account seasonal and time effects common to both Lincoln and Omaha's keno industries as well as local demand and supply factors, we find that average monthly keno revenue fell $1.37 more in Lincoln than it did in Omaha after the implementation of the smoking ordinance. The magnitude of the estimated effect is slightly smaller than that given by the simple difference-in-difference method, but the standard error is substantially smaller. Therefore, we are confident that the smoking ordinance in Lincoln was associated with a fall in Lincoln's average keno revenue. We estimate this loss to be about $376,120 per month during the year immediately following the implementation of the ordinance. This translates to a 19.04% decline in Keno revenue (wagers) over the previous year's average figure. (The full set of estimated coefficients from the difference-in-difference regression is presented in Appendix 3.)

Table 6
Keno Revenue ($2005) - Difference-in-Difference
Treatment Group: City of Lincoln
Control Group: City of Omaha

	Dif-in-Dif Estimator	
	Revenue per Person	**Total Revenue**
	(1)	(2)
A. *Gross Keno Revenue*		
BLINC	**-1.3719***** (0.1885)	**-$376,120*****

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.
Variances were calculated allowing for heteroskedasticity and autocorrelation.
*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

2. Lincoln MSA – Omaha Results

a. The Simple Difference-in-Difference Results

To gauge whether the smoking ordinance in Lincoln resulted in any change in keno revenue in the area immediately surrounding the city, we add monthly revenue from keno establishments in Lincoln to keno revenue generated in Denton, Waverly, Raymond, and Sprague. These towns account for the majority of keno revenue generated outside the City of Lincoln but within the Lincoln MSA. Omaha remains the relevant control city as it is unaffected by the smoking ordinance but its keno market is otherwise similar to the keno market in the Lincoln MSA.

The simple difference-in-difference results in Table 7 show a post-ban decline in average monthly keno revenue per person in the entire Lincoln MSA market. Average monthly Lincoln MSA keno revenue per person was $1.44 lower in 2005 than it was before the smoking ordinance was implemented. This decline was $1.17 more than the $0.26 per person decline in Omaha. Therefore, the simple difference-in-difference estimate shows the smoking ordinance was associated with a decline in average monthly keno revenue in the entire Lincoln MSA of about $322,162.

Table 7

Keno Revenue ($2005) - Simple Difference-in-Difference

	Revenue per Person				Total Revenue	
	Pre-Smoking Ban (Jan 2000 - Dec 2004)	**Post-Smoking Ban (Jan 2005 – Dec 2005)**	**Difference (2) - (1)**	**Simple Dif-in-Dif Estimator**	**Difference**	**Simple Dif-in-Dif**
	(1)	(2)	(3)	(4)	(5)	(6)
A. *Gross Keno Revenue*				**-1.1751***** (0.3256)		**-$322,162*****
Treatment Group:						
Lincoln MSA	**10.595** (0.1185)	**9.159** (0.2491)	**-1.436** (0.2758)		-$393,848	
Control Group:						
City of Omaha	**6.627** (0.0872)	**6.366** (0.1495)	**-0.261** (0.1731)		-$175,037	

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for sub-sample heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

b. The Conditional Difference-in-Difference Results

This section presents the conditional difference-in-difference estimate of the smoking ordinance effect on total keno revenue generated in Lincoln and the MSA towns. Once we control for common seasonal and time effects along with local demand effects, we still find a statistically significant decline in monthly keno revenue per person of about $1.06 or a drop in total revenue of $290,500 per month. (The full set of regression results is presented in the Appendix.)

Table 8
Keno Revenue ($2005) - Difference-in-Difference
Treatment Group: Lincoln MSA
Control Group: City of Omaha

	Dif-in-Dif Estimator	
	Revenue per Person (1)	**Total Revenue** (2)
A. *Gross Keno Revenue*		
BLINCMSA	**-1.0596***** (0.2765)	**-$290,500*****

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.
Variances were calculated allowing for heteroskedasticity and autocorrelation.
*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

The magnitude of the conditional difference-in-difference estimate of the smoking ordinance effect on total keno revenue in the Lincoln MSA does not differ much from that presented in the previous section. Because the estimated fall in keno revenue that occurred in 2005 was smaller in magnitude for the total Lincoln MSA than it was for the City of Lincoln alone, we investigate which, if any, of the other MSA towns experienced an increase in keno revenue after the smoking ordinance was implemented in Lincoln. If keno revenue increased in neighboring communities not subject to the ordinance, this would suggest that some smokers chose to switch their keno playing away from Lincoln and toward these communities. These results are presented in the next section.

3. City of Lincoln, Lincoln MSA Towns – Omaha Results

a. Simple Difference-in-Difference Results

Estimation of the smoking ordinance effect on each of the towns within the Lincoln MSA shows a statistically significant increase in monthly keno revenue after January 2005 in both Denton and Waverly. (The estimated revenue increase in the other towns of Raymond, Spraque, and the State Fair Park was small and statistically insignificant.) Tables 9 and 10 present the simple difference-in-difference results and show the average per person monthly keno revenues both before and after the ordinance for the two towns. In Denton, the $0.13 per person increase in revenue was about $0.39 more than the average increase in Omaha over the same period. In

Waverly, average monthly keno revenue rose about the same amount as Denton, about $0.39 more than in Omaha.

The simple difference-in-difference estimates suggest that both Denton and Waverly experienced more than a $100,000 monthly increase in keno revenue after the smoking ordinance relative to the control city of Omaha. Because the standard errors for each town's estimates are relatively small, we can conclude that the smoking ordinance was associated with an increase in average monthly keno revenue in Denton and Waverly based on the simple difference-in-difference methodology.

These results explain the lower magnitude of the simple difference-in-difference estimate for the Lincoln MSA when compared to that of the City of Lincoln; the smaller MSA revenue drop contains the partially offsetting effect of Denton and Waverly, where revenues have increased. Hence, we surmise that some of the keno business is relocating outside the City of Lincoln to places within the Lincoln MSA (such as Denton and Waverly).

Table 9
Keno Revenue ($2005) - Simple Difference-in-Difference

	Revenue per Person				**Total Revenue**	
	Pre-Smoking Ban (Jan 2000 - Dec 2004) (1)	**Post-Smoking Ban (Jan 2005 - Dec 2005)** (2)	**Difference (2) - (1)** (3)	**Simple Dif-in-Dif Estimator** (4)	**Difference** (5)	**Simple Dif-in-Dif** (6)
A. *Gross Keno Revenue*				**0.391****		**$107,197****
				(0.1942)		
Treatment Group:						
Denton	**1.600**	**1.729**	**0.129**		$35,402	
	(0.0299)	(0.0829)	(0.0881)			
Control Group:						
City of Omaha	**6.627**	**6.366**	**-0.261**		-$175,037	
	(0.0872)	(0.1495)	(0.1731)			

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for sub-sample heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

Table 10

Keno Revenue ($2005) - Simple Difference-in-Difference

	Revenue per Person				Total Revenue	
	Pre-Smoking Ban (Jan 2000 - Dec 2004)	**Post-Smoking Ban (Jan 2005 - Dec 2005)**	**Difference (2) - (1)**	**Simple Dif-in-Dif Estimator**	**Difference**	**Simple Dif-in-Dif**
	(1)	(2)	(3)	(4)	(5)	(6)
A. *Gross Keno Revenue*				**0.394***		**$108,019***
				(0.2076)		
Treatment Group:						
Waverly	**1.569**	**1.701**	**0.132**		$36,252	
	(0.0584)	(0.0982)	(0.1146)			
Control Group:						
City of Omaha	**6.627**	**6.366**	**-0.261**		-$175,037	
	(0.0872)	(0.1495)	(0.1731)			

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for sub-sample heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

b. Conditional Difference-in-Difference Results

This section further examines the extent of spill-over effects of the smoking ordinance from the City of Lincoln to surrounding towns in the Lincoln MSA using the conditional difference-in-difference estimator. By accounting for both seasonal and year effects common to the keno market in the Lincoln MSA and the City of Omaha and accounting for local demand shifts, the conditional difference-in-difference estimator produces more precise estimates of the effect of the smoking ordinance. Table 11 presents the estimated monthly change in keno revenue per person resulting from the implementation of the Lincoln smoking ordinance for the towns in the Lincoln MSA and for the City of Lincoln. (The full set of estimated regression coefficients from the panel data model is provided in Appendix 3.)

The results in Table 11 show that both Waverly and Denton experienced an increase in average monthly keno revenue in 2005 whereas Lincoln experienced a large drop. Waverly's average monthly keno revenue increased about $77,000, Denton's increased almost $70,500, and Lincoln's fell almost $430,000 per month. Each of these point estimates has a relatively small

standard error, so that we can conclude these estimated changes are not merely a result of sampling error. These results suggest that during 2005, on net, average monthly keno revenue (wagers) fell approximately $282,500 in the Lincoln MSA as a result of the smoking ordinance. They also lend further evidence to the notion that surrounding communities that offer keno, but are not subject to a smoking ordinance, benefited in terms of higher revenue at the expense of the City of Lincoln.

Table 11
Keno Revenue ($2005) - Difference-in-Difference
Treatment Group: Lincoln MSA Towns
Control Group: City of Omaha

	Dif-in-Dif Estimator	
	Revenue per Person	**Total Revenue**
	(1)	(2)
A. *Gross Keno Revenue*		
BLINC	**-1.5618*** **	**-$428,183*** **
	(0.1197)	
BWAVER	**0.2817** **	**$77,228** **
	(0.1197)	
BDENT	**0.2571** **	**$70,478** **
	(0.1197)	
BRAYM	**0.10862**	**$29,779**
	(0.1192)	
BSPRAG	**0.15291**	**$41,922**
	(0.1192)	
BSTFAIR	**0.12453**	**$34,141**
	(0.1192)	

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.
Variances were calculated allowing for heteroskedasticity and autocorrelation.
*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

V. CONCLUSION

On January 1, 2005 a smoking ordinance was implemented on workplaces, restaurants, and bars in the City of Lincoln. The primary motivation for the ordinance was employee health concerns; however, opponents argue that the ordinance will have adverse effects on local businesses, particularly the food and drink industry. *A priori*, the effect of the smoking ordinance is ambiguous, as it may result in smokers discontinuing their patronage at restaurants and bars

while non-smokers increase their patronage of restaurants and bars. The purpose of this study was to analyze the effect of the smoking ordinance on the relevant outcome measures. The outcome measures include the food and drink industry revenue and employment and keno revenue.

Based on our most precise estimates of the smoking ordinance effect (conditional difference-in-difference estimates), we find that for the first year after the smoking ordinance was implemented:

- *Revenue* - There was no statistically significant change in the revenue of eating places (full- and limited-service restaurants combined), but revenue fell in Lincoln drinking places
- *Employment* – Employment fell in full-service restaurants, but there was no statistically significant change in limited-service restaurants employment and no change in drinking places employment
- *Keno* – Keno revenue fell in Lincoln while keno revenue increased in Denton and Waverly.

At least two caveats must be considered when examining these results. First, we have only estimated the impacts of the ordinance for the year 2005 (and only the first three quarters of 2005 in the case of employment data), the first year the ordinance was in effect. It is possible that long-term impacts two to three years after the ordinance is in effect could differ from these impacts in the initial year. Second, one must keep in mind that the aggregate results for the industry or its segments do not necessarily reflect the experience of every business. Individual businesses or groups of businesses within each segment may have gained or lost revenue or employment as a result of the ordinance, regardless of the aggregate results present above. Results of this study, therefore, should not be seen as contrary to the testimonials of individual proprietors or industry employees as they explain how the law has affected them.

A. Economic Efficiency

The above analysis focused on the aggregate economic effect of the Lincoln smoking ordinance on bar, restaurant, and keno activity. It is important to remember that the analysis did

not consider all of the economic costs imposed on the consumers as well as on business owners and employees in Lincoln. In particular, important distributional and personal well-being costs have not fully been considered. The above analysis also did not measure public health benefits. First, some consumers of Lincoln restaurants, bars, and keno gaming have lost an option available to them–smoking in the midst of their chosen activity. In effect, this has caused them to reallocate their spending in an inefficient manner. They are now required to choose goods and services that were available before the ordinance that they did not choose, therefore revealing that the current choice is less desirable to them. Second, businesses may experience reduced profits or increased expenditures in making changes to accommodate their patrons. In fact, 29 Lincoln businesses obtained building permits to modify their building structure so smokers can still have a space at the business venue to smoke (*Lincoln Journal Star*, 2005). Persons considering the efficacy of the Lincoln smoking ordinance may wish to consider these costs, along with the results of our study, as well as any operating savings for restaurants and bars and the public health benefits in terms of reduced second-hand smoke when evaluating the policy.

APPENDIX 1: DEFINITIONS

The following definitions were taken from the web site of the US Census Bureau: www.census.gov/epcd/naics02

NAICS 722110 Full-Service Restaurants

Establishments primarily engaged in providing food services to patrons who order and are served while seated (i.e., waiter/waitress service) and pay after eating. These establishments may provide this type of food services to patrons in combination with selling alcoholic beverages, providing carry out services, or presenting live non-theatrical entertainment.

NAICS 722211 Limited-Service Restaurants

Establishments primarily engaged in providing food services (except snack and non-alcoholic beverage bars) where patrons generally order or select items and pay before eating. Food and drink may be consumed on premises, taken out, or delivered to the customer's location. Some establishments in this industry may provide these food services in combination with selling alcoholic beverages.

NAICS 722410 Drinking Places (Alcoholic Beverages)

Establishments known as bars, taverns, nightclubs, or drinking places primarily engaged in preparing and serving alcoholic beverages for immediate consumption. These establishments also may provide limited food services.

The analysis pertaining to the total food and drinking places includes the following categories in addition to the above three.

NAICS 722212 Cafeterias

Establishments primarily engaged in preparing and serving meals for immediate consumption using cafeteria-style serving equipment, such as steam tables, a refrigerated area, and self-service non-alcoholic beverage dispensing equipment. Patrons select from food and drink items on display in a continuous cafeteria line.

NAICS 722213 Snack and Non-alcoholic Beverage Bars

Establishments primarily engaged in (1) preparing and/or serving a specialty snack, such as ice cream, frozen yogurt, cookies, or popcorn or (2) serving non-alcoholic beverages, such as coffee, juices, or sodas for consumption on or near the premises. These establishments may carry and sell a combination of snack, non-alcoholic beverage, and other related products (e.g., coffee beans, mugs, coffee makers) but generally promote and sell a unique snack or non-alcoholic beverage.

NAICS 722310 Food Service Contractors

Establishments primarily engaged in providing food services at institutional, governmental, commercial, or industrial locations of others based on contractual arrangements with these types of organizations for a specified period of time. The establishments of this industry provide food services for the convenience of the contracting organization or the contracting organization's customers. The contractual arrangement of these establishments with contracting organizations may vary from type of facility operated (e.g., cafeteria, restaurant, fast-food eating place), revenue sharing, cost structure, to providing personnel. Management staff is always provided by the food service contractors.

NAICS 722320 Caterers

This industry comprises establishments primarily engaged in providing single event-based food services. These establishments generally have equipment and vehicles to transport meals and snacks to events and/or prepare food at an off-premise site. Banquet halls with catering staff are included in this industry.

APPENDIX 2: CONDITIONAL DIFFERENCE-IN-DIFFERENCE ESTIMATOR

The conditional difference-in-difference estimator of the smoking ordinance effect in Lincoln is the Generalized Least Squares (GLS) estimator of the regression coefficient δ in the following panel regression model:

$$y_{it} = \alpha + \sum_{j=1}^{11} \beta_{1t} monthj_t + \sum_{j=1}^{4} \beta_{2t} yearj_t + \beta_3 totalemp_{it} + \alpha_1 linc_i + \alpha_2 ban_t + \delta(linc_i * ban_t) + \varepsilon_{it}$$

y_{it} = industry activity in city *i* at time *t* (revenue is measured in $2005 per person in the relevant MSA population; employment is measured as industry workers per person in the relevant city or MSA population)

$monthj_t$ = 1, if *t* corresponds to month *j*; 0 otherwise.

$yearj_t$ = 1, if t corresponds to year 2000 + *j*; 0 otherwise.

ban_t = 1, if *t* > month 12 of year 2004; 0 otherwise.

$totalemp_{it}$ = total number of workers in all industries in city *i* at time *t*.

$linc_i$ = 1, if *i* corresponds to Lincoln; = 0, otherwise.

*linc *ban* = 1, if the city is Lincoln and the period is after December 2004.

We correct for heteroskedasticity in Lincoln's and the control location's errors, correlation across Lincoln's and the control location's errors, and first-order autocorrelation in both locations' errors over time. All estimation was performed using the econometrics software package *Shazam*. The resulting point estimates were checked for robustness to the model's assumptions by comparing the GLS estimates to ordinary least squares (OLS) estimates.

APPENDIX 3: PANEL DATA REGRESSION RESULTS

Appendix Table 3.1
Sales Revenue ($2005) - Difference-in-Difference
Treatment Group: City of Lincoln
Control Group: City of Omaha

	Estimated Coefficients		
	Eating places Real revenue ($100)	**Drinking places Real revenue ($100)**	**Eating and Drinking Places Real revenue ($100)**
Explanatory Variables			
JAN	-0.0776***	-0.001	-0.076***
	(0.012)	(0.002)	(0.013)
FEB	-0.0889***	-0.0029	-0.088***
	(0.0123)	(0.0022)	(0.014)
MARCH	-0.0095	0.0082***	0.0018
	(0.012)	(0.002)	(0.013)
APRIL	-0.0304***	-0.001	-0.0299***
	(0.0111)	(0.0019)	(0.013)
MAY	-0.0060	-0.0028	-0.0085
	(0.011)	(0.002)	(0.012)
JUNE	(0.000)	-0.0049***	-0.0051
	(0.0107)	(0.0018)	(0.012)
JULY	0.0020	-0.0060***	-0.0009
	(0.011)	(0.002)	(0.012)
AUG	0.004	-0.003	0.006
	(0.0107)	(0.0018)	(0.012)
SEPT	-0.0173	-0.0022	-0.014
	(0.01)	(0.00)	(0.01)
OCT	-0.0226**	-0.0009	-0.0194
	(0.0105)	(0.0016)	(0.012)
NOV	-0.0721***	-0.0060***	-0.0769***
	(0.0096)	(0.0014)	(0.010)
Y2001	-0.0016	-0.0013	-0.0002
	(0.0089)	(0.0018)	(0.011)
Y2002	0.0196**	-0.0072***	0.0189
	(0.009)	(0.002)	(0.01)

Appendix Table 3.1
Sales Revenue ($2005) - Difference-in-Difference

Treatment Group: City of Lincoln

Control Group: City of Omaha

	Estimated Coefficients		
	Eating places Real revenue ($100)	**Drinking places Real revenue ($100)**	**Eating and Drinking Places Real revenue ($100)**
Y2003	0.0230**	-0.0159***	0.0139
	(0.0089)	(0.0020)	(0.011)
Y2004	0.0484***	-0.0162***	0.0368***
	(0.0090)	(0.0020)	(0.011)
MSATEMP	0.0009	0.0004**	0.0017**
	(0.001)	(0.0002)	(0.0008)
BAN	0.0528***	-0.0207***	0.0342**
	(0.0111)	(0.0026)	(0.014)
BLINC	-0.0022	**-0.0062***	-0.0067
	(0.011)	(0.0036)	(0.014)
LINC	0.3896**	0.1432***	0.651**
	(0.1938)	(0.0460)	(0.23)
CONSTANT	0.3224	-0.0844	0.0425
	(0.312)	(0.0740)	-0.3774

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

Appendix Table 3.2
Employment (# of jobs) - Difference-in-Difference

Treatment Group: City of Lincoln

Control Group: Douglas County

	Estimated Coefficient				
	Total Food & Drink Employment	Total Full- & Limited-Service Restaurant Employment	Full-Service Restaurant Employment	Limited-Service Restaurant Employment	Drinking Places Employment
Explanatory Variables					
JAN	-0.0011***	-0.0011***	-0.0004**	-0.0006***	0.0000
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)
FEB	-0.0010***	-0.0010***	-0.0003	-0.0007***	0.0000
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)
MARCH	-0.0006**	-0.0006**	-0.0004**	-0.0002	0.0000
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)
APRIL	-0.0004*	-0.0005**	-0.0003**	-0.0002	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0000)
MAY	0.0001	-0.0001	-0.0002	0.0001	0.0000
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)
JUNE	0.0001	0.0000	-0.0002	0.0003**	0.0000
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)
JULY	-0.0002	-0.0002	-0.0003**	0.0001	0.0000
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)
AUG	0.0003	0.0002	-0.0001	0.0003***	0.0001
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)
SEPT	0.0002	0.0000	0.0000	0.0001	0.0001***
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)
OCT	-0.0002	-0.0003*	-0.0005***	0.0002*	0.0001
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0000)
NOV	0.0000	0.0000	-0.0002*	0.0001*	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
Y2001	-0.0003	-0.0004	-0.0001	-0.0001	-0.0001*
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)
Y2002	0.0005*	-0.0001	0.0006***	-0.0005***	-0.0001*
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)

Appendix Table 3.2
Employment (# of jobs) - Difference-in-Difference

Treatment Group: City of Lincoln

Control Group: Douglas County

	Estimated Coefficient				
	Total Food & Drink Employment	Total Full- & Limited-Service Restaurant Employment	Full-Service Restaurant Employment	Limited-Service Restaurant Employment	Drinking Places Employment
Explanatory Variables					
Y2003	0.0014***	0.0006**	0.0007***	0.0001	-0.0002***
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)
Y2004	0.0025***	0.0018***	0.0012***	0.0006***	-0.0002***
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)
MSATEMP	0.0000**	0.0000	0.0000***	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
BAN	0.0058***	0.0054***	0.0033***	0.0019***	-0.0004***
	(0.0004)	(0.0004)	(0.0003)	(0.0002)	(0.0001)
BLINC	**-0.0014****	**-0.0023*****	**-0.0023*****	**0.0004**	**0.0003**
	(0.0006)	(0.0006)	(0.0004)	(0.0004)	(0.0002)
LINC	0.0073	0.0013	0.0089**	-0.0065*	0.0013
	(0.0061)	(0.0062)	(0.0042)	(0.0037)	(0.0016)
CONSTANT	0.0196*	0.0270**	0.0005	0.0243***	0.0009
	(0.0103)	(0.0105)	(0.0072)	(0.0062)	(0.0028)

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

Appendix Table 3.3
Keno Revenue ($2005) - Difference-in-Difference

Control Group: City of Omaha

	Estimated Coefficient	
Treatment Group:	City of Lincoln	Lincoln MSA
Explanatory Variables		
JAN	0.1550	0.3310*
	(0.1616)	(0.1853)
FEB	0.0364	0.1636
	(0.1691)	(0.1983)
MARCH	0.3395**	0.5793***
	(0.159)	(0.1853)
APRIL	-0.2989**	-0.2275
	(0.1503)	(0.1726)
MAY	-0.3521**	-0.3068*
	(0.1445)	(0.1644)
JUNE	-0.8453***	-0.8552***
	(0.144)	(0.1642)
JULY	-0.5353***	-0.4062**
	(0.1459)	(0.1659)
AUG	-0.5222***	-0.4545***
	(0.1446)	(0.1638)
SEPT	-0.5204***	-0.4883***
	(0.1434)	(0.1611)
OCT	-0.1941	-0.1602
	(0.1409)	(0.1547)
NOV	-0.4907***	-0.5644***
	(0.1284)	(0.1342)
Y2001	0.2037	0.1544
	(0.1231)	(0.1540)
Y2002	0.4134***	0.4791***
	(0.1234)	(0.1586)
Y2003	0.3576***	0.2685*
	(0.1232)	(0.1575)
Y2004	0.2416**	0.0833

Appendix Table 3.3
Keno Revenue ($2005) - Difference-in-Difference

Control Group: City of Omaha

	Estimated Coefficient	
Treatment Group:	City of Lincoln	Lincoln MSA
Explanatory Variables		
	(0.1246)	(0.1591)
MSATEMP	0.0085	0.0201
	(0.0116)	(0.0148)
BAN	-0.1072	-0.2707
	(0.1793)	(0.2267)
BLINC (BLINCMSA)	**-1.3719*** **	**-1.0596*** **
	(0.1885)	(0.2765)
LINC (LINCMSA)	3.0446	9.5387**
	(3.2310)	(4.1100)
CONSTANT	2.8787	-2.2726
	(5.1900)	(6.602)

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

Appendix Table 3.4
Keno Revenue ($2005) - Difference-in-Difference

Control Group: City of Omaha

	Estimated Coefficient
Explanatory Variables	
JAN	-0.1050
	(0.0701)
FEB	-0.1257*
	(0.0670)
MARCH	0.0488
	(0.0619)
APRIL	-0.1606***
	(0.0597)
MAY	-0.1114*
	(0.0572)
JUNE	-0.2583***
	(0.0568)
JULY	-0.1955***
	(0.0598)
AUG	-0.1795***
	(0.0583)
SEPT	-0.1415**
	(0.0568)
OCT	-0.0670
	(0.0568)
NOV	-0.1523***
	(0.0569)
Y2001	0.1181***
	(0.0439)
Y2002	0.1709***
	(0.0413)
Y2003	0.1080***
	(0.0417)
Y2004	0.0897**
	(0.0444)
MSATEMP	-0.0270***

Appendix Table 3.4
Keno Revenue ($2005) - Difference-in-Difference

Control Group: City of Omaha

	Estimated Coefficient
Explanatory Variables	
	(0.0064)
WAVERLY	-12.5500***
	(1.7640)
DENTON	-12.5190***
	(1.7640)
RAYMOND	-14.0510***
	(1.7620)
SPRAGUE	-14.0490***
	(1.7620)
STFAIR	-14.0230***
	(1.7620)
LINC	-6.8077***
	(1.7640)
BAN	0.0480
	(0.1056)
BLINC	**-1.5618*** **
	(0.1197)
BWAVER	**0.2817** **
	(0.1197)
BDENT	**0.2571** **
	(0.1197)
BRAYM	**0.1086**
	(0.1192)
BSPRAG	**0.1529**
	(0.1192)
BSTFAIR	**0.1245**
	(0.1192)
CONSTANT	18.6350***
	(2.8230)

Pre-smoking ban years are 2000-2004. Post-smoking ban year is 2005. Standard errors are in parentheses.

Variances were calculated allowing for heteroskedasticity and autocorrelation.

*** Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level

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